

# High Voltage, High Power WBG Module Development

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Project Status: Ongoing Project Term: 1/1/2023-1/1/2025 Award Amount: \$200k Partners: Jack Flicker, Sandia National Lab

## Project Summary

- Design and development of a 3.3 kV, 120 A multichip module
- Reliability modeling, testing and evaluation

## Technical Approach

- XHP compatible module outline
- Heavy gauge bond wire alternatives interconnections to reduce power loop inductance
- Integrated gate driver and decoupling capacitors
- Potential integration of sensing components
- ANSYS Sherlock based reliability modeling

## Accomplishments

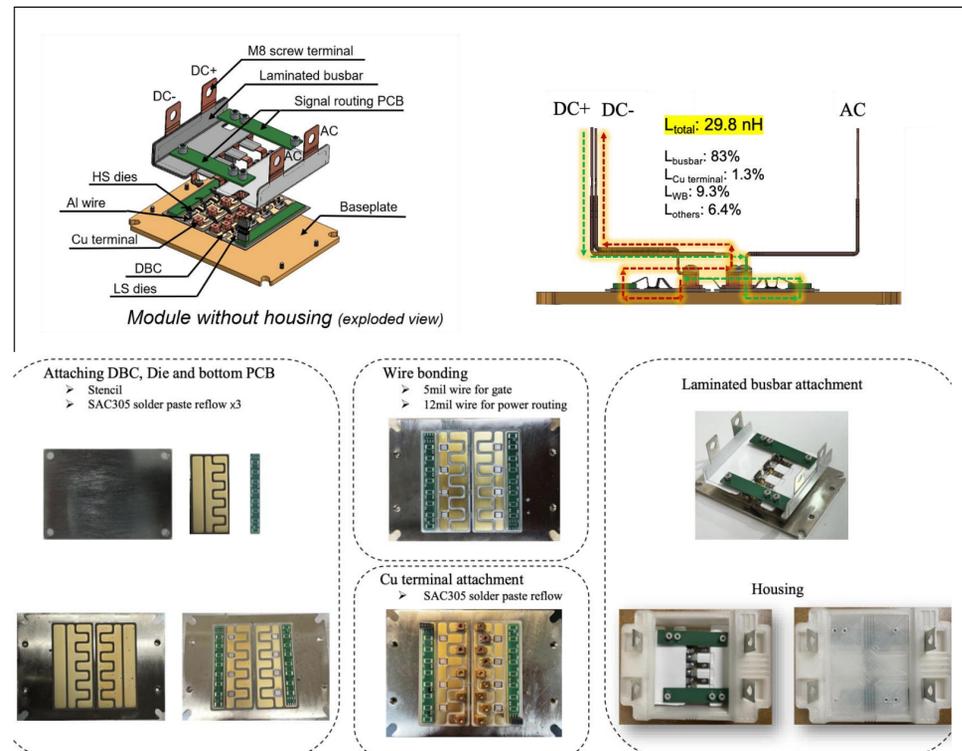
- Initial design was accomplished, exiting power loop inductance is 29 nH
- A dummy module with 1.2 kV device was prototyped for parasitics measurement and process evaluation
- Module thermal performance is being evaluated using chip resistors
- Partial discharge evaluation of the module design

## Impact/Commercialization

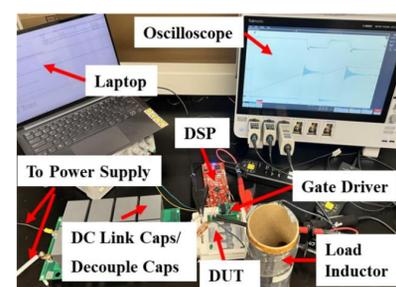
- Provide fundamental support to grid modernization and renewable energy integration
- enable scalability and potential low cost to future high voltage power conversion systems

## Future Work

- Accomplish the baseline design using 3.3 kV dies
- Accomplish thermal-mechanical evaluation
- FEA modeling for reliability
- Improve module design by further reducing its power loop inductance(a new design has been generated with expected loop inductance of 9 nH)



## Fabrication Process



Test setup for DPT

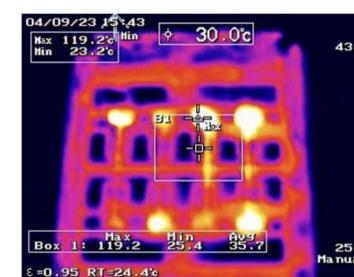
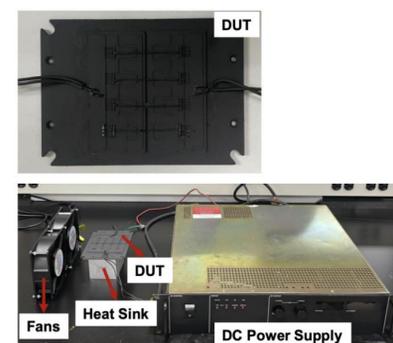
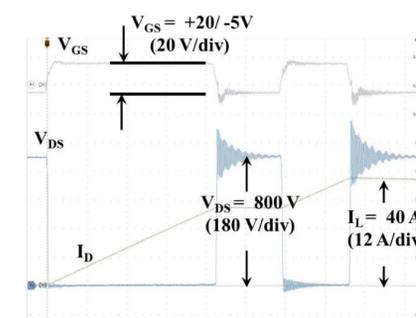


Image from thermal camera

## Thermal Testing